

(19) World Intellectual Property  
Organization  
International Bureau



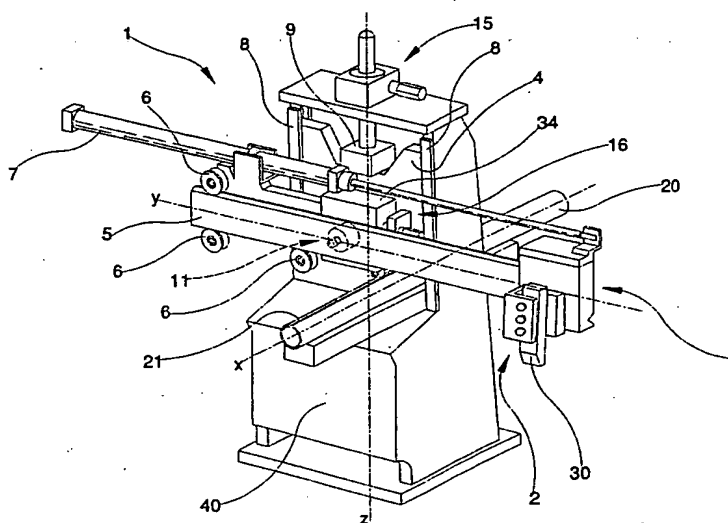
(43) International Publication Date  
29 December 2004 (29.12.2004)

PCT

(10) International Publication Number  
**WO 2004/113005 A1**

- (51) International Patent Classification<sup>7</sup>: **B23D 79/02**, **B21C 37/08**
- (21) International Application Number: **PCT/IT2004/000305**
- (22) International Filing Date: **26 May 2004 (26.05.2004)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:  
**MO2003A000184** **23 June 2003 (23.06.2003)** **IT**
- (71) Applicant (for all designated States except US): **OTO MILLS, S.P.A.** [IT/IT]; Via Domenico Marchesi, 4, Zona Industriale Rondello, I-42022 Boretto (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **CHEZZI, Alcardo** [IT/IT]; Via Firenze 9, I-42022 Boretto (IT). **MICALI, Luciano** [IT/IT]; Viale Cappuccini, 14/2, I-42016 Guastalla (IT).
- (74) Agent: **GIANELLI, Alberto**; Bugnion S.p.A.; No. 25 Via Emilia Est, I-41100 Modena (IT).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **A BEAD TRIMMER WITH A TOOL EXTRACTION SYSTEM**



(57) Abstract: The bead trimmer is preferably applied in a production line for elements having longitudinal weld beads (21), where an element slides along a parallel direction to a longitudinal axis thereof (x), and comprises a tool-bearing turret (2) for removable fixing of a trimming tool (30), associated to a first slide (3) which is slidable along a horizontal direction (y) which is transversal with respect to the longitudinal axis (x) between an internal position, in which the tool (30) is aligned with the weld bead (21), and an external position, in which the tool (30) is not aligned with the weld bead (21). The first slide (3) is associated to a second slide (4) which is vertically slidable on a bearing structure (40) along a vertical direction (z) between a lowered position, in which the tool (30) is in contact with the weld bead (21), and a raised position, in which the tool (30) is distanced from the weld bead (21).

WO 2004/113005 A1

-1-

DescriptionA Bead Trimmer with a Tool Extraction System.Technical Field

The invention relates to a bead trimmer with a tool extraction system. The field of use of the invention is lines of production of shaped elements, especially tubes, with longitudinal weld beads.

Background Art

5 The tubes are made from steel sheets which are moved and wound longitudinally to define the outside surface of the tube. The longitudinal edges of the sheet are welded together to close the tube, with a longitudinal weld bead. An external excess of bead has to be removed in the production line, in order to achieve a sufficiently regular external surface. The excess bead is usually removed  
10 mechanically using sharp tools which are brought into contact with the tube at a generatrix thereof along which the welding has been performed. The sliding longitudinal motion of the tube is also the movement used during the bead-trimming operation, the trimming tool remaining stationary.

In order not to halt production during tool replacement operations, two trimmers  
15 are arranged in the production line. During the tool-replacement operation on a first bead trimmer, the second is activated until the trimmer thereon has to be substituted, at which point the first trimmer is reactivated, and so on for successive cycles.

At present tool replacement is done manually and directly on the production line,  
20 by an operative. The operative is susceptible to considerable risks of injury, as he must work in proximity of the moving tube, as well as in proximity of the shaved

-2-

beading emerging from the working bead trimmer. As well as this, the tool-changing operation is rather slow and awkward, as the operative is forced to bend forwards, towards the axis of the tube from a frontal position with respect to the shape of the base of the machine, preventing him from getting any closer.

5 The main aim of the present invention is to provide a bead trimmer provided with a tool extraction system, which obviates the drawbacks in the prior art.

An advantage of the invention is that it enables the tool to be changed in a safe and comfortable position for the operative.

A further advantage of the invention is that repositioning the tool after  
10 replacement is done automatically, rapidly and precisely.

#### **Disclosure of Invention**

Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of a bead trimming machine with a tool extraction system,  
15 illustrated purely by way of a non-limiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic perspective view of the bead trimmer of the present invention in a tool-changing position;

figure 2 is a schematic perspective view of the bead trimmer of the invention in  
20 an operating condition;

figure 3 is a sectioned detail of the bead trimmer of the invention.

With reference to the figures of the drawings, the bead trimmer of the invention comprises a tool-bearing turret 2 for removable fixture of a bead trimmer 30 tool, for example of a type having a cutting edge made on a carbide plate. The turret  
25 2 is supported by means for controlled translation in at least one vertical direction z and at least one horizontal direction y which is transversal with respect to the longitudinal axis x between an internal work position and an external tool-

-3-

changing position, with a run sufficient for extracting the turret 2 from the work zone.

The means for controlled translation comprise a first slide 3, to which the turret 2 is associated, which is slidable along the horizontal direction y between the  
5 internal work position, in which the tool 30 is aligned with the weld bead 21, and the external position for tool changing, in which the tool 30 is not aligned with the weld bead 21. The axis x is parallel to the sliding direction of the tube 20. The first slide 3 is associated to an intermediate slide 34 which is associated in turn to a second slide 4 which is slidable vertically on a bearing structure 40 along  
10 direction z between a lowered position, in which the tool 30 is in contact with the weld bead 21, and a raised position, in which the tool 30 is distanced from the weld bead 21.

The first slide 3 comprises an elongate portion of guide 5, vertically gripped between at least three wheels 6, associated to the intermediate slide 34, which  
15 exhibit rotation axes which are parallel to the axis x and are conformed in such a way as to prevent displacements of the first slide 3 along direction x and along direction z. The first slide 3 can be translated along direction y by a first actuator cylinder 7, which has a stem thereof connected to the first slide 3 and a body thereof connected to the intermediate slide 34. The wheels 6, which peripherally  
20 exhibit a gulley predisposed to engage on the lateral side of the portion of guide 5, are mounted on supports provided with elastic means predisposed to enable the wheels 6 to move in direction x.

The intermediate slide 34 is mobile along direction y with respect to the second slide 4 by means of a calibration mechanism 16, for example a screw-nut type  
25 mechanism, which enables a correct centring of the tool 30 with respect to the weld bead 21.

The second slide 4 is vertically slidable between two parallel guides 8 by means

-4-

of a second actuator cylinder 9 which is operatively arranged between the second slide 4 and a vertical calibration mechanism 15, for example a screw-nut mechanism, which is operatively arranged between the second actuator cylinder 9 and a portion of the bearing structure 40.

5 The first slide 3 is blockable, with respect to the intermediate guide 34, when it is in an internal position, by means of a blocking device 11 which comprises a blocking and unblocking cylinder, operatively arranged between the first slide 3 and the intermediate slide 34, a stem of which exhibits a flange 17 predisposed to operate internally of a T-shaped hollow afforded on the first slide 3. The  
10 blocking and unblocking cylinder 12 is predisposed to exert a traction when at rest, by means of elastic means such as Belleville washers arranged coaxially to the stem, on the first slide 3 and to pull the first slide 3 into contact with the intermediate slide 34. When activated, the blocking and unblocking cylinder 12 exerts a force which is opposed to the force exerted by the elastic means and frees  
15 the first slide 3 from contact with the intermediate slide 34. The blocking and unblocking cylinder 12 operates in collaboration with a horizontal sliding guide 13, associated with the intermediate slide 34, which exhibits a wedge-shape in transversal section and which is predisposed to insert in a channel shaped specially therefor and afforded on the first slide 3, when the cylinder 12 is in the  
20 rest position. The sliding guide 13 is conformed and predisposed to define a vertical-direction reference with respect to the turret 2.

The invention offers considerable advantages. Firstly, the tool change can be performed in a safe position, as the operative can distance the turret from the production line. Both the displacement from the work position to the change-tool  
25 position, and the return to the work position, can be performed automatically, with considerable increase in the rapidity of the tool-changing operations. In particular the re-positioning of the tool after changing is performed rapidly and,

-5-

especially, precisely thanks to the use of guides and calibration systems for the described positions.

Claims.

1). A bead trimmer with a tool extraction system, preferably used in a production line of elements bearing longitudinal weld beads (21) in which an element slides along a direction which is parallel to a longitudinal axis (x) thereof, wherein it comprises a tool-bearing turret (2) for removably fixing a bead-trimmer tool (30), which turret (2) is supported by means for translating the turret (2) on command according to at least one vertical direction (z) and at least one horizontal direction (y) which horizontal direction (y) is transversal with respect to the longitudinal axis (x) between an internal working position and an external tool-changing position, with a run which is sufficient to extract the turret (2) from a working zone thereof.

2). The bead trimmer of claim 1, wherein the means for translating comprise a first slide (3), to which the turret (2) is associated; the first slide (3) being slidable along a horizontal direction (y) between the internal working position, in which the tool (30) is aligned with the weld bead (21) and the external tool-changing position, in which the tool (30) is not aligned with the weld bead (21), the first slide (3) being associated to the intermediate slide (34) which is associated to a second slide (4) which is vertically slidable on a bearing structure (40) along the vertical direction (z) between a lower position, in which the tool (30) is in contact with the weld bead (21) and a raised position, in which the tool (30) is distanced from the weld bead (21), the intermediate slide (34) being mobile along the horizontal direction (y) with respect to the second slide (4) in order to enable a correct centring of the tool (30) with respect to the weld bead (21).

3). The bead trimmer of claim 1, wherein the first slide (3) comprises an elongate portion of guide (5), vertically gripped between at least three wheels (6), axes of

-7-

rotation of which wheels (6) are parallel to the longitudinal axis (x), the at least three wheels (6) being associated to the intermediate slide (34) and being conformed in such a way as to prevent the intermediate slide (34) from displacing along the horizontal direction (y) and along the vertical direction (z), the first slide (3) being translatable along the horizontal direction (y) by means of a first actuator cylinder (7) which exhibits a stem connected to the first slide (3) and a body connected to the intermediate slide (34).

4). The bead trimmer of claim 2, wherein the wheels (6) are mounted on supports having elastic means predisposed to enable the wheels (6) to move along a rotation axis thereof.

5). The bead trimmer of claim 1, wherein the second slide (4) is vertically slidable between two parallel guides (8) by means of a second actuator cylinder (9) operatively arranged between the second slide (4) and a vertical calibration mechanism (15) which is operatively arranged between the second actuator cylinder (9) and a portion of the bearing structure (40).

6). The bead trimmer of claim 1, wherein the intermediate slide (34) is mobile along the horizontal direction (y) with respect to the second slide (4) by means of a calibration mechanism (16) which enables a correct centring of the tool (30) with respect to the weld bead (21).

7). The bead trimmer of claim 1, wherein the first slide (3) is blockable with respect to the intermediate slide (34) when the first slide (3) is in a internal position, by means of a blocking device (11) comprising a blocking and unblocking cylinder (12) arranged between the intermediate slide (34) and the first slide (3), a stem of which cylinder (12) exhibits a flange (17) predisposed to operate internally of a T-shaped hollow afforded on the first slide (3), the blocking and unblocking cylinder (12) being predisposed in a rest position thereof to exert a traction force, by means of elastic means, on the first slide (3)



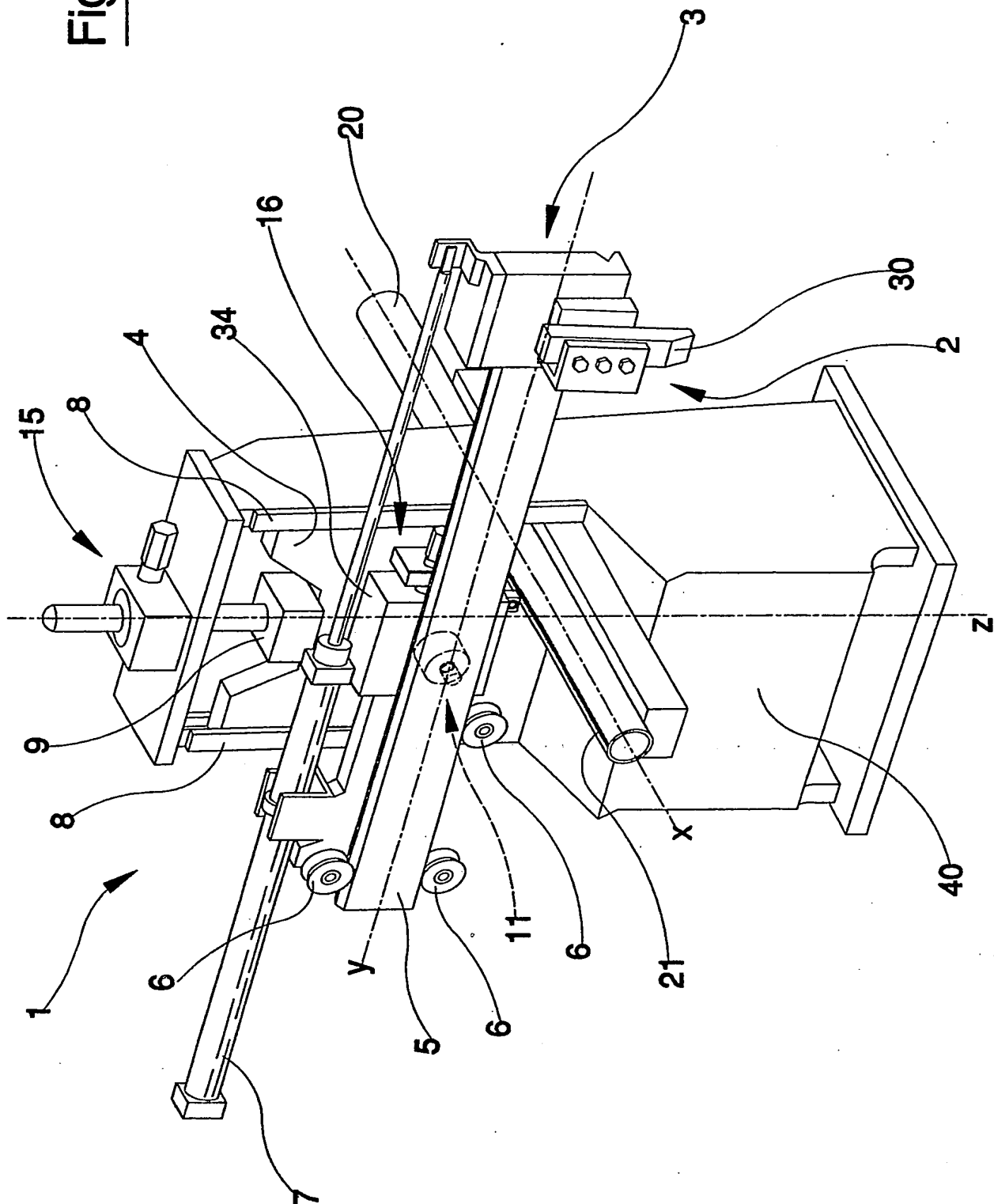
-8-

and to pull the first guide into contact with the intermediate slide (34), and, when activated, to exert a force which is opposed to the force exerted by the elastic means and to free the first slide (3) from contact with the intermediate slide (34). 8). The bead trimmer of claim 6, wherein the blocking and unblocking cylinder

5 (12) operates in collaboration with a horizontal sliding guide (13) associated to the intermediate slide (34), which sliding guide (13) exhibits, in transversal section, a wedge shape and which is predisposed to insert in a channel shaped accordingly thereto and afforded on the first slide (3), when the blocking and unblocking cylinder (12) is in a rest position thereof, the sliding guide (13) being

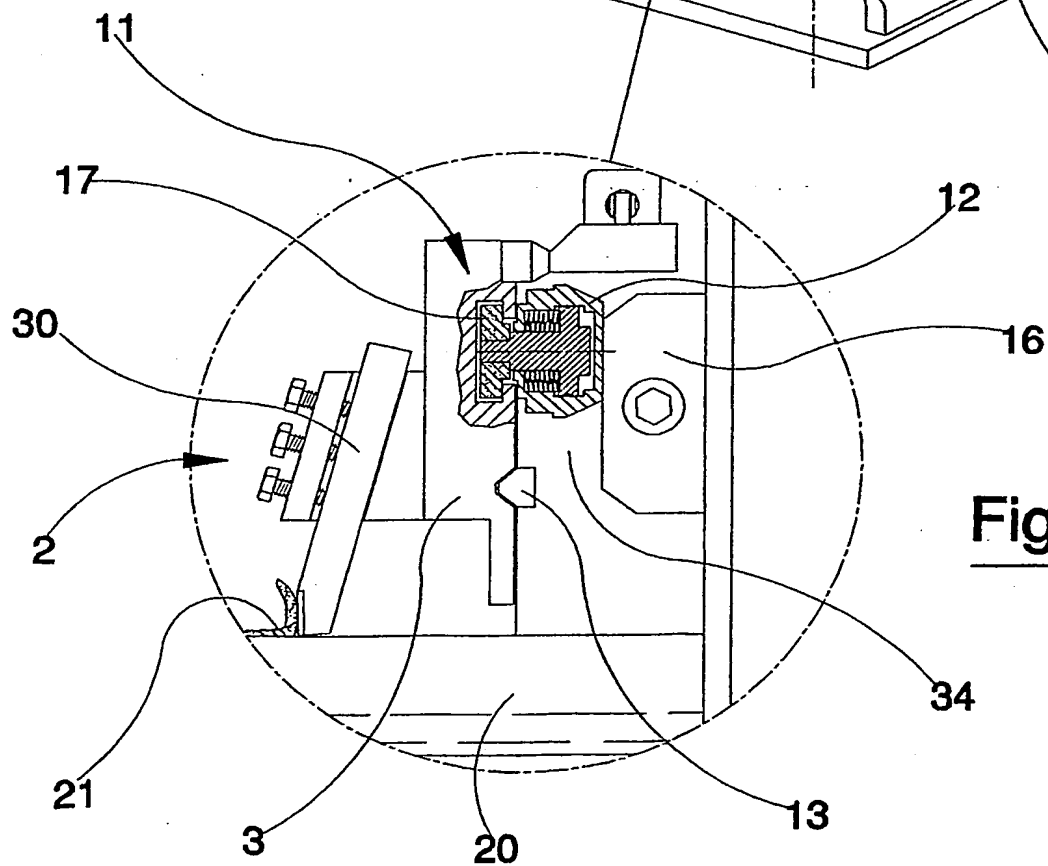
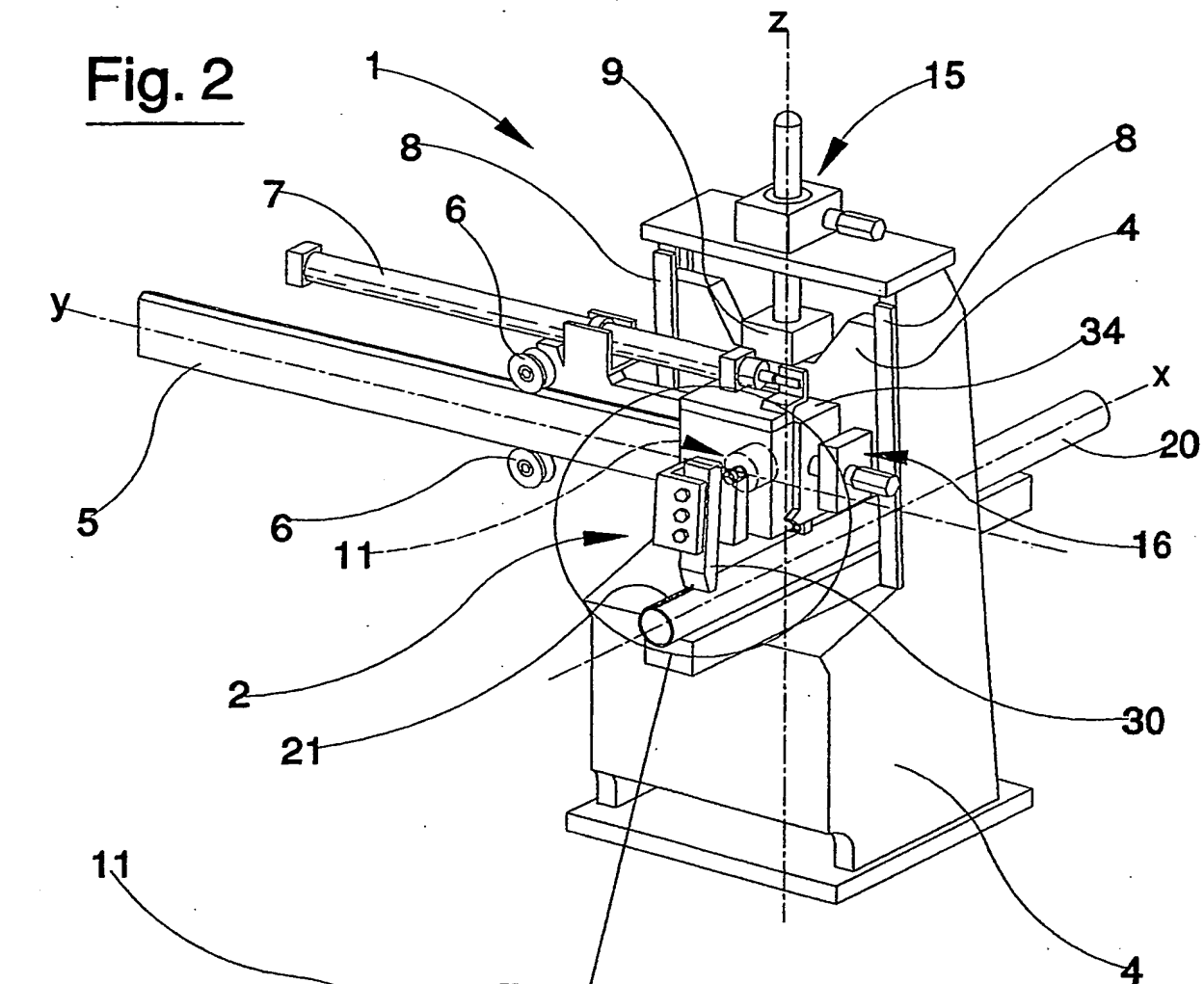
10 conformed and predisposed to define a reference with respect to a vertical direction for the turret (2).

**Fig.1**



2/2

**Fig. 2**



**Fig. 3**

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IT2004/000305

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B23D79/02 B21C37/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B23D B21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 192 013 A (ABBEY III NELSON D ET AL) 9 March 1993 (1993-03-09)	1
A	column 2, line 5 - column 6, line 34; figures 1-4	2-8
X	US 2 959 842 A (MEYERS RICHARD A) 15 November 1960 (1960-11-15)	1
	column 5, line 63 - column 6, line 3; figures 6,7	

☐ Further documents are listed in the continuation of box C☒ Patent family members are listed in annex.

## \* Special categories of cited documents

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*G\* document member of the same patent family

Date of the actual completion of the international search

23 September 2004

Date of mailing of the international search report

30/09/2004

Name and mailing address of the ISA

European Patent Office, P B 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Frisch, U

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT2004/000305

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5192013	A	09-03-1993	NONE	
US 2959842	A	15-11-1960	NONE	